WOMEN, FLOWERS AND ECOLOGY - POWER OF FLORICULTURE IN ENHANCING LIVELIHOODS OF RURAL WOMEN IN THE DRYLANDS OF WESTERN INDIA

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Introduction

The Government of India had declared 2001 as the 'Year of Women's Empowerment' by passing a national policy to enhance the status of women in society. However, much of the rural women's work is not systematically accounted for in official statistics and the national data collection agencies admit that there is under-estimation of tribal women's contribution as workers (Leach and Sitaram 2002). On the contrary, in urban areas, women have impressive number in the workforce. The software industry has employed 30 percent of female; they are equal with their male counterparts in terms of wages and position Nonetheless, in rural India, agriculture and allied industrial sectors employ as much as 89.5 percent of the total female labor (FAO 2008). For instance, most tribal women who live in the harsh drylands of western India plow fields and harvest crops while working on farms− they contribute to the economy in one form or another. They weave and make handicrafts while working in household industries; they sell food and gather wood while working in the informal sector. They are also traditionally responsible for the daily household chores such as cooking, fetching water and looking after children (Agoramoorthy and Hsu 2008a, b).

According to the report published by the National Commission for Enterprises in the Unorganized Sector in 2007, 836 million people (77 percent) in India live on less than half a dollar a day (NCEUS 2007). Besides, there has been on average one farmer suicide every 30 minutes since 2002 (NCRB 2007). While India's unprecedented economic growth is cheering for many, the looming agriculture crisis in remote villages have gone virtually unnoticed. The majority (68 percent) of India's workforces relies on farming despite the fact that the agriculture contribution to the gross domestic product has diminished from 38 percent in 1975 to 19 percent in 2007 (Puri 2007; Agoramoorthy and Hsu 2008a, b). Therefore, the role of small rural enterprises in poverty alleviation is crucial (Berger 1989).

The income generated by women primarily pay for the food and basic needs while income from men usually goes for assets, luxuries and liquor. This realization has led to the development of world's initial strategy of promoting income generating activities for women on a large scale (Boserup 1989). The strategy did not fully succeed since impoverished rural women are increasingly faced with fewer opportunities to work due to lack of skills, education, and access to technologies, tools and productive assets. Furthermore, they are burdened with household routine and care for the family. As there are not enough employment opportunities for rural women, support for women self-employment came to realizes women's economic potential (Kraus-Harper 1998). Many non-profit agencies subsequently taken on the task of women empowerment through micro-enterprise in recognition of the impact it can have on women, their families, and poverty alleviation (Meyer and Nagarajan 2000). One such intervention is agro-based floriculture practiced predominantly by tribal women who inhabit the drylands of western India. In this report, details are presented on how floriculture could enhance not only the livelihoods of rural women but also local ecology in the poorest tribal villages of India.

Study Area Description

The present study to investigate the impact of floriculture was carried out in Dahod District in Gujarat State, which has an area of area 3,642 km². The district harbors a population of 1,636,433 with a density of 449 persons / km^2. About 25 percent of the land area comes under the jurisdiction of the State Forest Department (Government of India, 2001). The region receives 860 mm of annual average rainfall but due to irregular pattern resulting in drought every third year. This drought prone region is one of the poorest in Gujarat State. The predominant population (72%) belong to *adivasi* (meaning 'original people', also known as 'tribal') of the *Bhils* tribe. In most tribal communities of India, land is inherited in the male line and marriage is predominantly patrilocal. Daughters' right to the ancestral property of their fathers is recognized only when there are no male lineal descendents; women can also inherit as a widow or mother of a deceased.

Political institutions such as the council of elders, village headman, village *Panchaya*t and the tribal chiefs are mostly males. However, 33 percent of panchayat (village council) now have women Sarpanch (elected council members). Only sons can succeed their fathers as the head of a clan or a lineage. However, in the tribal economy, the role of women is more articulate.

Although men predominantly plough the land for agriculture, women perform other agricultural tasks such as soil preparation, planting, weeding, harvesting and storing food; they participate in economic decisions within the family (Jagawat 2005). Socially, women of the Bhil community enjoy more freedom of movement compared to their non-tribal counterparts. Remarriage of a divorcee or a widow are generally more accepted and birth of girls is welcome. The Bhils tribe practices a bridal price where the bride's family receives cash/materials from the groom's family while most non-tribal communities practice the other way around (Saini and Koppen 2001).

Methods of Survey and Data Analysis

Between January 2006 and December 2007, data on the impact of floriculture in local community were collected from 25 villages in Dahod District, Gujarat State of western India. The floriculture project has been implemented by a local non-profit agency called 'NM Sadguru Water and Development Foundation', which is based in Chosala village, Gujarat State, India. It is popularly known as 'Sadguru' (Sanskrit meaning 'true teacher') and it was created in 1974. It is India's premier non-profit organization known globally for its contributions to community-based sustainable and equitable rural development, poverty alleviation and natural resource management (Jagawat, 2005). During village visits, data on the name of village, household information, poverty level (above or below), family size, and economic benefits derived from floriculture were recorded following the methods of Mikkelsen (1995).

All statistical analyses were conducted using Statistical Analysis System software (SAS Institute 2000). All mean values are presented as ± 1 standard deviation (SD). The total flower production, income and size of plot were positively correlated to each other (Pearson Correlation, $p<0.001$, $n=377$). Therefore, we standardized the production and income as the amount of products (kg) per 100 m^2 and income (USD dollars) produced per 100 m^2. The income increment was the current product selling minus the previous product earning. A general linear model was constructed separately to analyze the effect of flower types on the dependent variable (such as flower production, income, income increment as well as daily income per person) (SAS Institute 2000).

Results and Discussion

Rural Women and the Power of Flowers

Between January 2006 and December 2007, rose farming and marigold farming were the most frequent flower farming and each accounted for 32.4%, and followed by Gaillardia farming (28.6%) and a mixture of rose and marigold farming (6.6%). The average income before the transformation of flower farming was 11.5 dollars (± 7.9, n=377) and the average revenue of flower farming production was 252.3 dollars (± 262.3, Table 1). Hence, the income revenue after farming transformation was 29.5 to 18.3 times of the previous income, with an average of 21.9 fold increase (Table 1). The average increment of flower farming profits was 240.8 dollars (n=377) ─ the highest increment revenue occurred on rose farming (303.4 dollars ± 323.9, Table 1).

The flower production per $100m^2$ had significant impact by the types of flowers farmed ($F_{3, 373} = 9.51$, $p<0.001$). The flower production was highest with Gaillardia (98.27 Kg/100 m^2 ± 49.48, n=108, Fig. 1), which was significantly higher than those from marigold and mixed flower farming (Duncan multiple range test, $p<0.05$). The lowest flower production was the mixture of rose and marigold farming (12.38 Kg/100 m2 ± 20.84).

When the floriculture areas were standardized, the types of flowers played a significant effect on flower income revenue ($F_{3, 373}=6.61$, $p<0.001$) and income increment ($F_{3, 373}=6.64$, $p<0.001$). The highest profit came from rose farming (75.91 dollars/100 m2 ± 132.59, n=122, Fig. 2), which was significantly higher than those from marigold and mixed flower farming (Duncan multiple range test, $p<0.05$). The lowest profit came from the mixture of rose and marigold farming (20.88 dollars/100 m2 ± 15.20, n=25). Those patterns were similar in the income increment (Fig. 2). The average daily income per person was also highest in rose farming (5.8 dollars ± 2.8) and lowest in the mixed flowers (4.5 dollars ± 2.7, $p<0.05$, Fig. 3)

Economic Benefits of Floriculture in Rural Areas

A small village located in Dahod District called Rozam (population 2079) became a ‘Village of Flowers’ after the initiation of floriculture (Fig. 4 and Fig. 5). The village is inhabited predominantly by tribal communities. Prior to 2001, women mainly cultivated maize, corn, wheat and other pulses. After starting floriculture, their economic benefits significantly improved. For example, Ramila, a lady farmer cultivated two flower crops such as rose and

marigold in a small area of 0.3 acre in 2006; she sold roses and marigold worth USD 1,400 within a period of three months. By seeing the huge profit, she started a nursery the flowing year with 2000 plants by grafting the mother plants and sold them at the rate of USD 1 per 10 plants. She earned a profit of USD 200 just from the plants. After seeing the instant profit obtained by Ramila, other women in the village started nurseries to raise flower plants. About 80 percent of farmers in Rozam village cultivate flowers since 2007 besides their usual cereal crops. There are 60 women-managed floriculture nurseries are in action as of September 2008.

The transformation of flower farming draws significant social, economic and ecological benefits for the poorest tribal women who live in the drylands of western India. The transformation of flower farming in fact has increased income 29.5-18.3 times of the previous income (Fig. 2 and Fig. 3). The most valuable flower in this study was rose with the highest income increment per area and daily income per woman. Although the income revenue after farming transformation were 29.5 times of the previous income in mix species farming, the production of flower as well as income and income increment per unit of area were the lowest in mixed flower farming.

The traditional flowers such as chrysanthemum, jasmine, crossandra, rose, tuberose, aster, marigold, and champaka are usually grown in open areas while the contemporary flower crops (roses, gerbera, carnation, etc) are grown in controlled green houses in towns and cities. While both are important for the flower industry, the traditional floriculture is more crucial as it is predominantly practiced by the poorest tribal women in western India.

Marketing of flowers was not a problem due to constant demand for flowers in the local market in Dahod town, which is located within a radius of 10 miles from the study villages. When the market in Dahod town faced often flower shortages during religious festivities and marriage ceremonies, people purchased flowers from the villages directly and the festival/marriage days brought an average individual profit of USD 8-24/day (usually USD 5-15/day), depending on the farmers' landholding. Prior to floriculture in villages, the tribal farmers, especially women, had no idea about cultivating flower crops since they are used to cultivate mainly local cereals. Staff members from the Sadguru Foundation's floriculture division taught a few women farmers initially in each village on the techniques of growing flowers. Subsequently, women farmers were able to grow and sell flowers in the nearby town.

India's floriculture gradually increased from 9900 acre in 1962 to 220,000 acres in 2000, which is lower than neighboring China (Raghavan 2000). Despite the recent outburst of floriculture in rural India, it has not made any remarkable breakthrough in the national and global markets due to various constraints that include lack of awareness on the potential of floriculture, weak infrastructural support, insufficient cold storage facilities, lack of efficient marketing system, exploitation by middlemen, weak database, and absence of information on income/ employment generation from various flower cultivation, export barriers, insufficient government subsidy, and weak investment (Thippaiah 2005). India's share in the world flower trade is 0.4-0.5 percent as compared to Netherlands (65 percent), Columbia (12 percent), Italy (6 percent), Israel (4 percent), Kenya (1 percent) and other countries (20 percent). The proportion of total floricultural area has been calculated at 99 percent for Colombia, 70 percent for the Netherlands and 57.51 percent for Italy while it is only 0.56 percent for India (Thippaiah 2005). To top it all off, the government and corporate sectors generally view floriculture as marginal farming, predominantly practiced by rural women. For this reason, comprehensive efforts have not been seriously implemented to shape India's rural floriculture as a successful global enterprise.

Ecological Benefits of Floriculture in India's Drylands

The practice of modern floriculture is well known since it severely affects soil fertility, groundwater, land quality, and human health. In India, the fertilizer use in hi-tech rose cultivation has been estimated to be 15,000 kg/ha, which is 100 times more than normal requirement of a food crop flowers (Prakash 2002). Besides, the hi-tech floriculture crops are prone to diseases such as red mite, black spot, and powdery mildew. In order to control the diseases, green houses usually spray gallons of strong pesticides/fungicides weekly. The use of pesticide in India's hi-tech floriculture is 16 times higher compared to traditional flowers (Chengappa and Reddy 2002). The workers engaged in the application of the chemicals suffer from headache, impaired vision,eye irritation, asthma, and skin diseases even after wearing masks and gloves (Prakash 2002; Veena 1998). On the other hand, the traditional floriculture is highly sustainable with the use of traditional inputs such as farm yard manure that includes vermi-compost, animal dung, green leaves, fodder and other organic waste from farms and houses.

Unlike water-intense crops such as sugarcane, rice or wheat, floriculture neither consumes more water nor damage local ecology. Women farmers have to pay for water (electricity on an hourly basis) to grow flowers in their farms from wells so they naturally reduce water waste. They do not require canal irrigation for floriculture. The water use efficiency in most canal irrigation systems connected to megadams as low (30–40 percent, against an ideal value of 60 percent) due to wastage, silting, weed growth, broken structures and poor maintenance (Planning Commission Report 2007).

Social Benefits of Floriculture in Villages

The production of flowers is an ancient occupation in India. The national flower, lotus has been frequently mentioned in the ancient Hindu Vedic texts written in Sanskrit language (Randhawa and Mukhopadhyay 2004). In spite of this, the flower trade did not find a place in the horticultural literature for centuries. Till the 1960s, the flower trade was restricted locally within villages and towns where women primarily grew and sell various types of flowers in the neighborhood since fresh flowers could not survive a long journey to elsewhere. This situation has changed during the last few decades. Farmers are now growing different flowers both for domestic market and export purposes and the fresh flowers are now moving long distances due to the availability of air transport and refrigerators (Singh and Upadhyaya 2007). Villages where floriculture is expanding, attracting local government support to build infrastructure such as roads, schools and health facilities.

Women who grow flowers in rural areas have gained opportunities to interact with outsider business communities and traders; they are no longer shy to approach government officials and NGOs on behalf of their villages to negotiate assistance for sustainable development projects. The floriculture business in villages has empowered women to take up unconventional jobs such as site supervisors, nursery raisers, or village agricultural extension workers. More and more women are also participating in the village councils as *Panchayati Raj* (elected members). Besides, the women have learnt to market their value added flower products (garlands, bouquet, etc) locally and near by towns during festivities, cultural ceremonies, religious functions. The flower industry has transformed the poor rural women to mobilize as a group to take various activities such as dairy cooperatives, savings and credits, floriculture groups, horticulture groups, etc. They became more vocal in community development. The small-scale floriculture in rural areas has undoubtedly energized and

empowered tribal women to enhance their livelihoods, economy and local ecology. Thus it has the potential to contribute immensely for sustainable development in the drylands of western India.

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Table 1 Flower types, plot size, total production and increment of income for rural tribal women farmers in India. Data presented as mean ± SD.

Flower type	number of farmers	Size of plot (100 m^2)	Flower production (Kg)	Income (USD)		Increment (USD)
				Before	After	
Gaillardia	108	5.3 ± 2.6	476.7 ± 329.9	12.7 ± 9.5	260.7 ± 273.9	248.1 ± 269.7
Marigold	122	5.6 ± 3.0	278.9 ± 191.2	10.1 ± 6.4	184.6 ± 155.8	174.5 ± 155.9
Rose	122	5.1 ± 2.0	320.7 ± 179.4	12.5 ± 6.2	315.9 ± 323.9	303.4 ± 322.1
mix*	25	10.2 ± 3.1	154.0 ± 321.3	8.0 ± 11.3	236.2 ± 217.3	228.2 ± 214.9
Total	377	5.6 ± 2.9	340.8 ± 262.1	11.5 ± 7.9	252.3 ± 262.3	240.8 ± 260.0

*mix with rose and marigold.

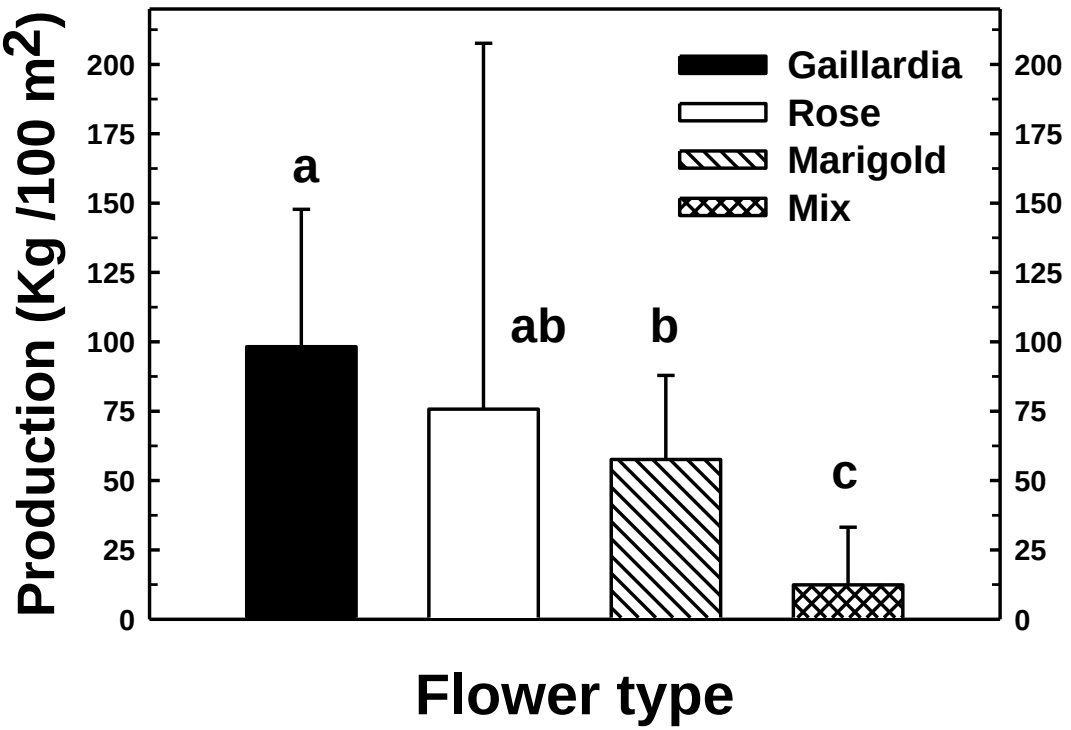

Fig. 1 Flower production (Kg/100 m^2) for rural tribal women farmers in India. Data presented as mean ± SD. Mix species: rose and Marigold mixed. a, b and c were from Duncan multiple range test and different letters indicated significant differences existed ($p<0.05$).

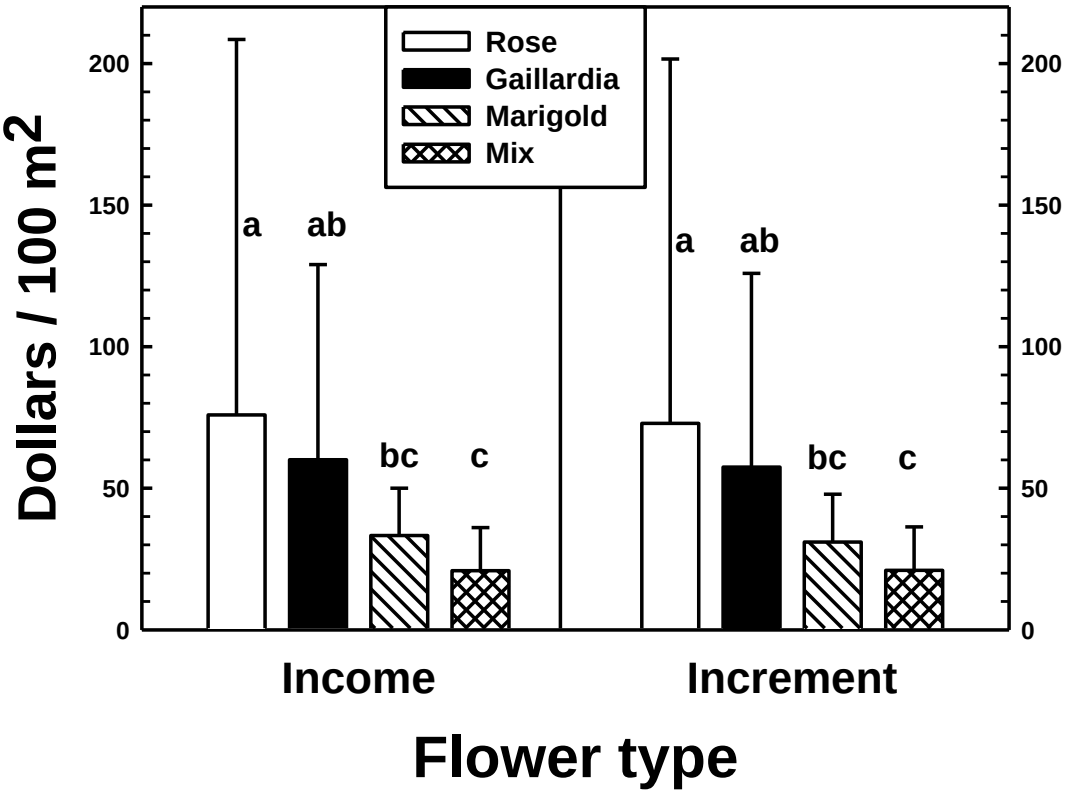

Fig. 2 For every 100 square meters, current income and income increment (USD) compared to early farming from different flower species production for rural tribal women farmers in India. Data presented as mean ± SD. Mix species: rose and Marigold mixed. a, b and c were from Duncan multiple range test and different letters indicated significant differences existed ($p<0.05$).

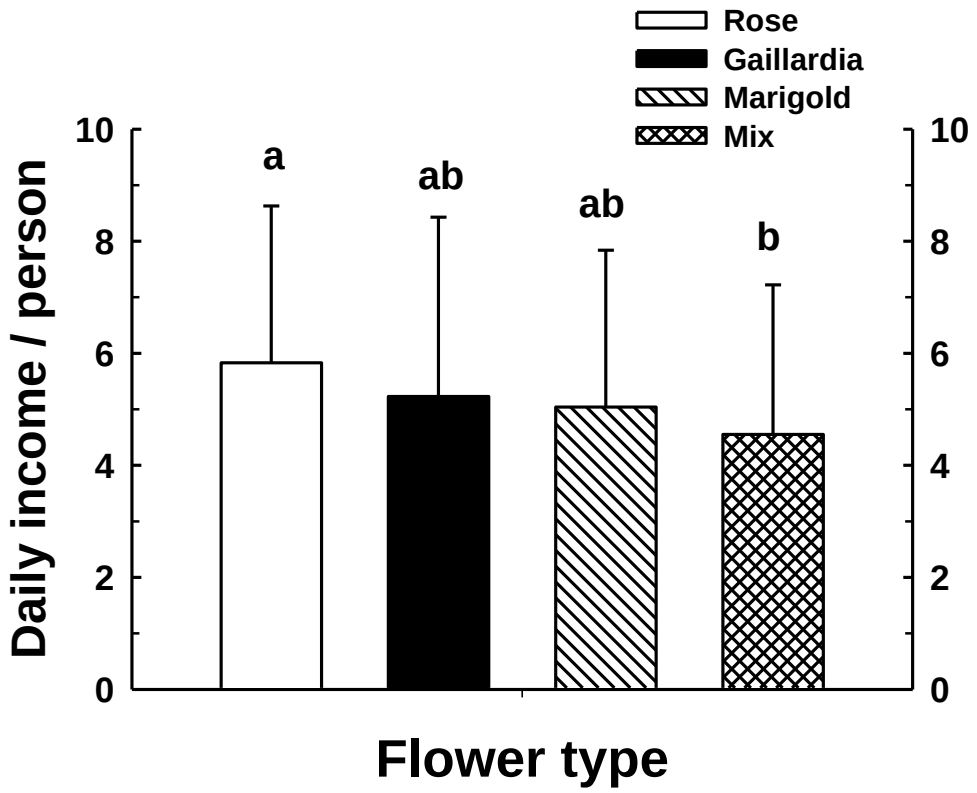

Fig. 3 Daily income per person (USD dollars) for different flower species for rural tribal women farmers in India. Data presented as mean ± SD. Mix species: rose and Marigold mixed. a, b and c were from Duncan multiple range test and different letters indicated significant differences existed ($p<0.05$).

Fig.4 Tribal women in Rozam village, Dahod District of Gujarat State in western India picking rose flowers from the farm

Fig. 5 Tribal women in Rozam village, Dahod District of Gujarat State in western India picking marigold flowers from the farm